Original Clinical Articles

Sleep Apnea: A Prospective Study

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Sleep apnea is remarkably prevalent among general medical patients. Of 26 men randomly selected on a Veterans Administration hospital medical ward, with a mean age of 66.2 (SD = 11.5) years, 7 (27%) had sleep apnea. Of concern is that two of the seven patients were receiving hypnotic drugs. Portable sleep recordings may need to be done when routinely assessing elderly medical patients.

In recent years a growing number of investigators have described large clinical case series of patients who have sleep apnea.[1,2] Nevertheless, many physicians still regard it as a rarity.

Findings from several studies have suggested that sleep apnea may indeed be highly prevalent among older persons. Webb[3] reported that sleep apnea was caused by changes in the central nervous system and that age heightened these changes. Block and co-workers[4,5] found that sleep apnea was positively correlated with increasing age in both men and women. Reynolds and associates[6] reported that of the elderly patients seen in their clinic because of sleep disturbances, 18.5% had sleep apnea. Most of these studies, however, describe patients from sleep disorder clinics. Two separate groups have studied population samples from senior citizen clubs. Carskadon and Dement[7] selected seniors who stated they were in good health and did not have sleep problems. Remarkably, 37% of these persons had sleep apnea syndrome, largely central sleep apnea. Ancoli-Israel and colleagues[8] selected seniors who had symptoms related to sleep. The same percentage—37%—was found to have sleep apnea syndrome, but a much larger percentage of these subjects had mixed or obstructive apnea, and 37% also had periodic movements during sleep (leg jerks).

Because many inpatients are older,[9] we became interested in the question of how often sleep apnea presents in a general clinical setting. To explore this question, we surveyed randomly selected patients on a medical ward.

Patients and Methods

Patients

Our study comprised 26 men, with a mean age of 66.2 years (±11.5; range, 38 to 88). The subjects were volunteers from a general medical service in a Veterans Administration (VA) Medical Center. The service is an academic teaching service with a high turnover; the average stay of patients is eight days.

House officers were consulted as to which patients from each day's admission list were too medically unstable or demented to participate. Patients expected to be discharged within three days of admission were also excluded. The patients excluded made up 45% of all the patients admitted during the study, a period of three months. Candidates were randomly selected from the remaining 55%, and each was asked to volunteer for the study.

Apparatus

A Medilog four-channel portable recorder was used to record sleep.[10] Two channels recorded thoracic and abdominal respiration by means of Respitrace transducers.[11] A third channel summed electromyographic signals from the musculus tibialis anterior of both legs. The fourth channel recorded dominant wrist activity. These four-channel recordings allowed analysis of wake and sleep, number and duration of apneic episodes and number of leg jerks.*

Procedure

Each subject gave a full sleep history and a brief medical history. Each was then hooked up to a recorder for one night (mean, 15 hours). All recordings were done at a patient's hospital bed on his own ward. To allow a patient's sleep to adjust to the hospital environment, each recording was done between the third and seventh day of hospital stay. Each patient was also asked to subjectively evaluate his sleep the morning following the recording. Because the recording equip-

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TABLE 1.—*Characteristics of 43 Men Selected for Study*

Patients Asked to Participate	*Number*	*Mean Age (SD)*	*Patients With COPD Number*
Recorded	26	66.2 (11.50)	3
Dropped out	2	60.0 (1.41)	2
Refused recording	15	65.5 (14.65)	4

SD = standard deviation; COPD = chronic obstructive pulmonary disease.

TABLE 2.—*Description of Sleep Apnea in Seven Male Patients*

Subject	*Age*	*Episodes of Apnea Number*	*Duration of Longest Apnea (sec)*	*Type of Apnea*
1	55	41	28	Central
2	59	46	22	Central
3	88	56	20	Central
4	73	86	36	Central
5	63	200	54	Mixed
6	71	298	27	Mixed
7	74	311	24	Mixed

ment is portable, each patient was completely ambulatory. This minimized changes in a patient's routine and minimally interfered with that person's normal sleep patterns.

The sleep records were evaluated for the presence or absence of sleep apnea and nocturnal myoclonus. Sleep apnea was diagnosed when there were 30 or more episodes of apnea observed during sleep, each of at least ten seconds' duration. In addition, the apnea index (the number of occurrences of sleep apnea per hour of sleep) had to equal or exceed 5.0. For the patient's benefit, diagnostic findings were reported to medical staff.

Results

Patient Selection

In all, 43 male patients were asked to give informed consent for the study under procedures approved by the VA Committee on Human Subjects. (Patients in the VA Medical Center are primarily men; therefore, we were unable to include women.) Of the 43 patients who were asked to participate, 15 refused. Of the 28 patients who consented, 2 suffered exacerbations of preexisting dyspnea during the recordings and requested to have the apparatus removed. Subsequent follow-up showed that the dyspnea was unrelated to the recording apparatus. In all, 26 recordings were completed without incident or adverse effects. There seemed to be a trend (P less than .06) for patients with chronic obstructive pulmonary disease to refuse consent or to drop out of the study. There were no significant differences in the ages of the patients recorded and those refusing consent (see Table 1).

Medical History

None of the patients had had sleep apnea previously diagnosed nor had sleep apnea been suspected by prior medical evaluations. Of note is that 11 of the patients (42%) recorded had been admitted for cardiac-related problems.

Sleep Disorders Results

Of the 26 patients recorded, 7 (27%) were found to have sleep apnea—that is, more than 30 episodes of apnea per night and an apnea index equal to or greater than 5.0. Three additional patients (11.5%) had 24 to 27 episodes of apnea, thus almost meeting criteria. None of the patients had nocturnal myoclonus.

Characteristics of the patients with sleep apnea are shown in Table 2. The mean age of the seven apneic patients was 69.0 ± 11.09 years (range, 55 to 88 years of age). The mean age of the nonapneic patients was 62.5 ± 11.36 years (range, 38 to 88 years of age). There was no significant difference in age between the two groups. The three patients who had 200 or more episodes of apnea per night had mixed, but largely obstructive, apnea. The other four patients had central sleep apnea.

Associations between sleep apnea and various other characteristics of the patients were examined with the Fisher's exact probability test. Congestive heart failure was significantly more prevalent in the apneic group than in the nonapneic group (P less than .05). Higher incidences of hypertension, diuretic use, myocardial infarction, angina, snoring and morning drowsiness were also noted in the apneic group, but these associations were not significant. Chronic obstructive pulmonary disease was less prevalent among the apneic patients, but this again was not significant. No associations were found with insomnia complaints, elevated hematocrit or use of sleeping pills.

Discussion

This study shows that sleep apnea is remarkably prevalent among elderly patients on a medical ward. Seven (27%) of our medical patients had sleep apnea. Three patients (11.5%) had a moderately severe form, having more than 200 episodes of apnea per night. Our study patients were somewhat older than the national average of medical inpatients,[9] however, which might explain the relatively high prevalence among them. In addition, in excluding those patients who were acutely ill or demented, we possibly excluded those who had sleep apnea. Although patients who had chronic obstructive pulmonary disease were reluctant to participate in the study, we found little evidence of apnea among them. Also, the patients with sleep apnea had significantly more congestive heart failure than the patients with no sleep apnea. Further studies are needed to determine the causal relationship between these two disorders.

Exact percentages of patients who have sleep apnea will vary from hospital to hospital. As mentioned, although our subjects were inpatients, they were also predominantly elderly and so our results support other findings that sleep apnea is prevalent among older persons.[3-8] Of course, this age group makes up a substantive percentage of all hospital patients. The results of our study highlight the importance of examining sleep apnea in general medical settings.

It is interesting that despite efforts our sleep clinic

has made to educate our colleagues, and despite the heightened interest produced by our ongoing survey, our medical service did not suspect sleep apnea in any of these patients before our recordings. If failure to recognize sleep apnea occurs in an informed academic setting, much the same failure could occur elsewhere. It is of particular concern that two of our seven apnea patients received hypnotic drugs, though these respiratory depressants could be expected to worsen sleep apnea.[12] The widespread use of hypnotics on medical wards must be rigorously questioned if sleep apnea is so common.

Our portable recording technique proved extremely practical and convenient. Although we did not record oxygen saturation levels, the portable recorder does allow for clinical screening. Because it is clearly difficult to make a diagnosis of sleep apnea based on history alone, we believe that, like electrocardiograms, portable recordings for sleep apnea deserve a place in the routine assessment and screening of elderly medical patients.

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Articles to Read in Other Journals

The Cutaneous Manifestations of Diabetes Mellitus
Huntley AC
Journal of the American Academy of Dermatology
7:427-455, Oct 1982
DISCIPLINES: Dermatology, Internal Medicine, Family Practice
READABILITY: Good

This is an extensive review that supplies the reader with essentially all the information on the cutaneous changes and markers for diabetes. It should be of value to all physicians who are involved with the diagnosis and care of patients with diabetes.

—JOHN H. EPSTEIN, MD
San Francisco